excentricity of the solar orbit, and its result in producing lunar acceleration."

With reference to the practicability of reducing the extent of the printed volume of "Greenwich Observations," the report concludes with some of the suggestions that have been made by certain members of the Board. The introduction, it has been suggested, might to some extent be stereotyped. No reduction, it is thought, should be made, in regard to the details of meridional and altazimuth observations.

To the strong appeal made for extension of the spectroscopic observation of stars, in reference to their motion in the line of sight, the Astronomer-Royal has given a tacit response by the modification of the S. E. Equatorial, so as to facilitate that extension. "The tendency of external scientific movement," he remarks, "is to give great attention to the phenomena of the solar disk (in which this observatory ought undoubtedly to bear its part). And I personally am most unwilling to recede from the existing course of magnetical and meteorological observations. All these, however, are inferior in importance, with regard to the question now before us, to the extent of printing the original details of astronomical observations."

"The general tendency of these considerations is," the report concludes, "to increase the annual expenses of the Observatory. And so it has been, almost continuously, for the last forty-two years. The annual ordinary expenses are now between two and a half and three times as great as in my first years at the Royal Observatory. I would fain flatter myself that the value of its results has increased in a greater degree."

NATURAL SCIENCE DEGREES AT OXFORD

DR. ODLING, replying in the *Times* to Canon Liddon's letter, referred to in NATURE, vol. xx. p. 132, maintains that unless some little Greek is considered absolutely essential to a liberal education, there can be no ground for refusing a degree in arts to students who, though unacquainted with Greek, are familiar with such like studies as geometry, arithmetic, and astronomy, which equally with grammar, dialectics, and rhetoric, have been counted from time immemorial among the liberal arts. And assuming the compulsory modicum of Greek now brought up by mathematical and natural science students to be a non-essential element of their liberal education, as certified to by a degree in arts, how can a degree in arts be hereafter refused to advanced students of either of these subjects who, while still bringing up Latin, shall in future offer a considerable amount of German, together with some amount of both mathematics and natural science as a substitute for the present modicum of Greek?

Dr. Odling, rather than degrade science by awarding its graduates an inferior degree, seems disposed to retain the little modicum of Greek at present required for a pass; he would have been contented with Canon Liddon if the existing arrangements had been undisturbed. His objection is not to the incubus of Greek, but to the slur about to be put on natural science.

Canon Liddon replies that, in speaking of the educational advantages of Greek, he was in part thinking of the *minimum*. He believes Dr. Odling mistaken in thinking that the new degree was intended as anything but an honourable distinction. No one could suppose, he believes, that the majority of the present Council could be unfriendly to physical science. The statute appeared to him to be drawn almost exclusively in the interests of natural science students, and with a view to relieving them of an uncongenial study.

In a subsequent letter Dr. Odling quotes a passage from a lecture delivered by Dr. Whewell some twenty-five years ago. In the course of showing that the great contributions made to intellectual education by Greece, Rome, and modern Europe in succession have been geometry, jurisprudence, and physical science respectively, he wrote as follows:—

"Our intellectual education now, to be worthy of the time, ought to include in its compass elements contributed to it by every one of the great epochs of mental energy which the world has seen. . . . A mind well disciplined in elementary geometry and in general jurisprudence would be as well prepared as mere discipline can make a mind for most trains of human speculation and reasoning. . . . But however perfectly the habits of deduction may be taught by these studies, such teaching cannot, according to the enlarged views of modern times, compose a complete intellectual culture. . . . As the best sciences which the ancient world framed supplied the best elements of intellectual education up to modern times, so the grand step by which, in modern times, science has sprung up into a magnitude and majesty far superior to her ancient dimensions should exercise its influence upon modern education, and contribute its proper result to modern intellectual culture."

Happily the further discussion has been postponed until Michaelmas Term; by that time it is hoped that some method will be found by which natural science will be honoured without hurting the feelings of any one. We may state that the Council of the Cambridge Senate recommend to the Commissioners that power be given in the statute to recommend degrees in science (B.Sc., M.Sc., D.Sc.).

ON SOME MARINE ALGÆ[1]

THE successor of Harvey in the Chair of Botany in the University of Dublin has taken, as his eminent predecessor did, the algæ for the principal object of his study. In 1877 Dr. E. P. Wright published in the *Transactions* (vol. xxvi. Science) of the Royal Irish Academy two memoirs, one on a green unicellular alga (*Chlorochytrium Cohnii*) parasitic in the mucous tubes of some diatoms, in *Polysiphonia urceolata*, and in *Calothrix confervicola;* the other on a parasite deprived of chlorophyll (*Rhizophydium Dicksonii*), which develops itself in the cells of an Ectocarpus, and which has been taken, at least in one case (*E. crinitus*, Harv.), for the fruit of an Ectocarpus. This present year the *Transactions* of the same Academy contain two additional memoirs by the same author, which are accompanied by three coloured plates drawn by Tuffen West. The latter memoirs seem to me to be conceived in a spirit, and executed after a manner, which one does not always meet with in the writings of the British algologists. Dr. Wright has studied the living plants, an innovation on which he cannot be too much congratulated. One would only wish that his exact and minute observations on the development of organs, a subject in which he has shown himself at home, had been joined to an experimental determination of their functions, a determination which morphology by itself is powerless to declare to us. It is easy to prove this latter statement by a few instances taken from authors whose abilities have been placed beyond all doubt. Thus it has been said over and over again—Naegeli himself believes it ("Algensysteme," p. 134, Pl. 1, Fig. 34; 6)—that the heterocysts of the Nostocs are reproductive bodies, while experiments the most easily made prove that they are nothing of the sort. Cramer ("Phys. syst. Untersuch. über die Ceramieen," Heft 1, p. 125) has mistaken the antheridia of Bonnemaisonia for young cystocarps. Dr. Wright has, as we will show further on, been himself the victim of a similar error. Morphology is not like the spear of Achilles; it does not heal the wounds which it makes.

Griffithsia setacea is a pretty, red alga, well known to

[1] From the French of Ed. Bornet.

all collectors of marine plants. It is composed of branched filaments made up of large cylindrical cells placed end to end in a single row. When it is in fruit, the filaments are furnished with short branches terminated by a globular involucre, in the interior of which are ranged the reproductive bodies. How are these formed, and how do these filaments and appendages grow? What modifications do the cell-contents experience during this formation and growth? These are the points explained with a good deal of clearness by Dr. Wright in the first of the two latter memoirs referred to (on the cell-structure of *G. setacea*, and on the development of its antheridia and tetraspores). Referring to the memoir itself for details, I would only call attention to a peculiarity noticed in the development of the involucre. The rays which compose it take their origin in a circle from the penultimate cells of particular ramuli, formed by a small number of cells and slightly club-shaped at their superior extremity. These rays are not all at once free. Detached from the protoplasmic mass on which the apical cell reposes, they for a long time increase underneath the common membrane which clothes the frond, and they are only made free somewhat later on by the rupture of this membrane. First of all figured, but very imperfectly by Derbes and Solier, well represented from life by Thuret, this peculiar disposition is shown by Dr. Wright as made clear by the use of reagents, and it would appear to be equally met with in the genus Pandorea, recently described by J. Agardh.

In following from their first appearance the development of the reproductive organs on the rays of the involucre, Dr. Wright observed that the cells destined by their origin and their position to form the tetraspores, did not all comport themselves in the same manner. Some of them produced the ordinary four spores, but in the interior of the others globular cells arose provided with a beak, from which there came out colourless corpuscles, wonderfully like the antherozoids of the Florideæ. The resemblance of these bodies to species of Olpidium did not escape Dr. Wright, but struck by their constant presence on the specimens which he examined, by the regularity with which they appeared on determined points of the involucre, he thought they might be regarded as the antheridia of *Griffithsia setacea*, and here he has overlooked the fact that true antheridia, of the ordinary type in the Florideæ, had long since been described and figured in this very species by Thuret (*Ann. des Sc. Nat.* 3 ser. Bot. Tom. 16). On this occasion Dr. Wright, however, records an observation as new as interesting, viz., that he has seen the corpuscles as they left these wrongly imagined antheridia perform movements after the manner of amœbæ.

In the second of the two memoirs, having for its title "On the Formation of the so-called 'Siphons,' and on the Development of the Tetraspores in Polysiphonia," the author describes with much care the method of the formation of the frond in *Polysiphonia urceolata*, and very exactly proves the relationship existing between the "tube central" and the "siphons," and between the siphons themselves. For a great part he therein only confirms the results of those preceding him in such investigations, for the history of the development of the frond in Polysiphonia has been almost exhausted by the works of Naegeli, Kny, and Magnus. I am almost afraid that an analysis of these minute details would inspire the reader with that horror which, according to Naegeli, such morphological researches bring with them to the systematic botanists, but I cannot bring myself to omit extracting the following passage, in which some curious vital phenomena are incidentally described by Dr. Wright, as he found them to exist in the cells of Bryopsis.

"Under the influence of some local irritation, which must not be enough to injure the cell wall of the specimen under examination, the denser portion of the protoplasm will often be found to draw itself from the upper part of these cells. As it does so, the very conspicuous chlorophyll granules will be seen to be drawn together until they become pretty tightly packed. There is an apparent rounding off of the upper portion as it gets drawn down in the tube of the cell wall, and under a low power of the microscope this convex surface seems pretty sharply defined; but turn on a high quarter of an inch or an eighth of an inch objective, and a very remarkable phenomenon will present itself—for there will then be seen a mass of pseudopods not easily to be forgotten and difficult to describe under any other name; they stream away from below the apex of the cell wall, converging downwards until they are lost in the centre of the convex margin of the withdrawing mass of protoplasm. Here they are broad, while towards the apex of the cell they disappear through their very tenuity. Coursing down along these pseudopods, very minute granules can be, on careful focussing, detected; these are ultimately lost in the denser protoplasmic mass which engulphs them. This streaming goes on for a while, until all the protoplasm of a certain density is drawn into the lower mass; this then finally rounds itself off and forms an independent cell wall in front, which of course will be below the former growing point of the cell. There is apparently no plastic protoplasm remaining above this—no small disc even of homogeneous mucilage to be seen; all the viscid protoplasm seems to have gone to the rear, and it would appear as if the upper portion should now become sphacelated—perhaps disappear—and a new apical growth proceed from below it; but this is not so; there is life in the front still; it goes on growing as before, and in process of time it will be found to leave in its rear dense chlorophyll-bearing protoplasm, and so on through the several layers until the *punctum* itself is, as before, reached."

OUR ASTRONOMICAL COLUMN

BIELA'S COMET.—As bearing upon the possible return of Biela's comet during the latter part of the present year, it will not be out of place if we here summarise the results of an investigation made by Prof. Oppolzer in 1873, on the possible connection of the comet discovered by Mr. Pogson at Madras on December 2 previous, with Biela's comet and the great meteoric shower of November 27, 1872. It will be remembered that the comet in question was found in consequence of a telegram sent by Prof. Klinkerfues to Madras immediately after the meteoric display, to the effect that Biela's comet had "touched the earth" on the evening of November 27, and urging Mr. Pogson to search for it near the star θ Centauri. From the Madras observations on the nights of December 2 and 3 (the only occasions on which the weather was favourable), as they were first approximately reduced, Oppolzer derived the following data:—

1872, December 3·0 M.T. at Berlin.

Comet's geocentric longitude (λ)	223°	15′·6
,, ,, latitude (β)	− 20	10·0

And the unit of time being a mean solar day,

$$\frac{d\lambda}{dt} = +187'{\cdot}0, \quad \frac{d\beta}{dt} = +46'{\cdot}3.$$

At a subsequent time Mr. Pogson published more accurate positions of the comet than those at first communicated, which would give the following similar data, differing, it will be seen, in no material degree from those adopted by Oppolzer:—

1873, December 3·0 M.T. at Greenwich.

λ ... 223° 21′·1 β ... −20° 8′·6 $\frac{d\lambda}{dt}$ ... +189′·9 $\frac{d\beta}{dt}$ ... +46′·4

It had soon been found, as might have been expected, that no satisfactory conclusion could be arrived at by comparison of Michez's elements of Biela's comet with